

Spinoff From Mooncraft Technology

Among a selection of spinoffs that enhance public safety is a fire protection material derived from Apollo's heat shield

Descending from orbit after a mission to the moon, the Apollo Command Module carrying three astronauts plunged into Earth's atmosphere at something close to 25,000 miles per hour. At that tremendous velocity, air friction built up temperatures on the spacecraft's exterior surfaces as high as 5,000 degrees Fahrenheit—yet the interior remained comfortable.

The reason was Apollo's heat shield, which was coated with an "ablative" material. The material was literally allowed to burn off, dissipating heat energy and thereby delaying temperature buildup on the spacecraft's structure. In addition, the burned material charred to form a second protective coating that blocked heat penetration beyond the outer surface.

The Apollo heat shield was designed and built by Avco Corporation. Subsequently, Avco entered into a contract with Ames Research Center to develop spinoff applications of the heat shield technology in the field of fire protection. The successful NASA effort, followed by further company research and development toward new applications, led to a line of fire protection materials produced by Avco Specialty Materials, a subsidiary of Textron Inc., Lowell, Massachusetts. One of the most widely accepted of the family is Chartek® Fireproofing.

Developed a decade ago, the original formulation was known as Chartek 59. Its protective properties were dramatically demonstrated in 1985, in a spectacular fire test when NASA and the Federal Aviation Administration deliberately crashed a jetliner in a safety evaluation of a new type of aircraft fuel. The airplane's fuselage was almost entirely destroyed by a fire that raged for more than two hours. But interior cameras and tape recorders, encased in boxes coated with Chartek 59 and sealed with a special silicone foam, emerged intact, the film still usable.

Since then the formulation has been made even more effective, through a mesh re-



In Saudi Arabia, a worker sprays Chartek Fireproofing on structural parts of a crude oil processing plant. The long life fireproofing material is a spinoff from the heat shield that brought returning Apollo astronauts safely through temperatures as high as 5,000 degrees.

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inforcement improvement, introduced in 1986, that offers longer-term fire endurance. The improved product is known as Chartek III Fireproofing.

Chartek III Fireproofing provides long-term fire protection for structural steel in high risk industrial applications, such as the structure, conduits, pipes and valves of off-shore platforms and storage tanks used in the hydrocarbon processing industry. As was the case in the Apollo heat shield, the spray-on epoxy coating delays temperature buildup on the surfaces to which it is applied; it is, in other words, a means of buying time in a fire environment, allowing time to extinguish the fire, to redirect threatened fuel supplies, or to evacuate people.

In the presence of fire, Chartek III Fireproofing provides two kinds of protection.

One of them is ablation, the technique used on Apollo involving dissipation of heat by burnoff. The other is called "intumescence," or swelling. Heat causes the Chartek coating to swell to a thickness six times greater than when it was applied, forming a protective blanket of char that retards transfer of heat to the steel structure. The mesh reinforcement keeps the char intact and reduces metal fatigue.

Chartek Fireproofing provides fire protection for as much as two or three hours, depending on the type of fire and the thickness of the coating applied. And because the material is non-porous, it offers bonus value as a superior coating for long-term protection against corrosion when there is no fire. ▲

Freshly coated with Chartek Fireproofing, a segment of an off-shore oil platform awaits delivery to its working site. The fireproofing material is in wide use in the oil industry and in other industries where there is high fire risk.